Innovative Research in
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An Edited Book

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Variability of Active Galactic Nuclei

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ABSTRACT

This chapter is based on the minor research project "Temporal study of X-ray emission from active galactic nuclei" sanctioned by UGC. In this chapter we have discussed variability of Two (Ton S180 and 1H0707-495) Active Galactic Nuclei (AGN), on the basis of light curves of the source, hardness ratio and colour-colour diagram and cross correlation for light curves.

Keywords: *AGN, X-ray variability*

1. INTRODUCTION

It is found that practically all AGN when observed over a long enough period of time [1]. Variability reaches down to timescales of hours in some objects [2]. Variability by several orders of magnitudes is observed on timescales of decades in some objects ([3][4][5]). Variability is observed throughout the wavelength range from radio [6] through optical [1][7][8]) up to X-rays[9]. The variability can usually be described as so-called 'red noise' with a slope of about-2 [4] [9, 10]. It is yet unclear if breaks in the power spectrum, which would be associated with a characteristic time scale of the variability, are present or if detections of such breaks are due to the uneven and limited time-sampling of the lightcurves [5]. Some authors also successfully used other statistical prescriptions such as for example damped random walks to describe AGN light-curves[11] but it is generally recognized that AGN variability is 'random'. AGN and Galactic black hole systems are variable in every observable wave band. The X-ray flux exhibits variability on time scales shorter than any other energy band, indicating that the emission occurs in the innermost regions of the central engine. Therefore, a study of the X-ray variability provides an additional powerful tool to probe the extreme physical processes operating in the inner parts of the accretion flow close to the accreting black hole. One of the reasons is that the light curves have been often considered as a by-product of the spectral analysis, which still catalyzes most of the attention and efforts and indeed provides important results. However, often time-averaged X-ray spectra can be equally well described by quite different physical models. The constraints from the temporal and spectral variability can be used to break this spectral degeneracy. A light curve is a graph which shows the brightness of an object over a period of time. In the study of objects which change their brightness over time, such as novae, supernovae, star and variable Active Galactic Nuclei, the light curve is a simple but valuable tool to a scientist. Light curves can be generated for any measure of brightness which is repeated over and over in time. So, if we measured the number of X-rays being emitted by a galaxy during every second for an hour, we could generate a light curve from our observations.

2. OBSERVATIONS

Table 1: Basic Parameters of target objects

Sr. No.	Galaxy	Luminosity Distance	Source region (arc sec)	Redshift (z)	Obs. Id.	Exposure Time (ks)
1	Ton S180	263 Mpc	6	0.06198	811	76.17
2	1H0707-495	174 Mpc	4	0.040568	2304	33.11